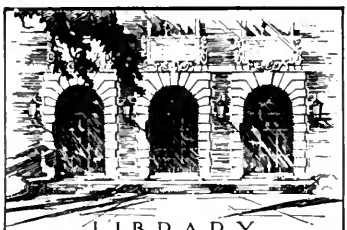
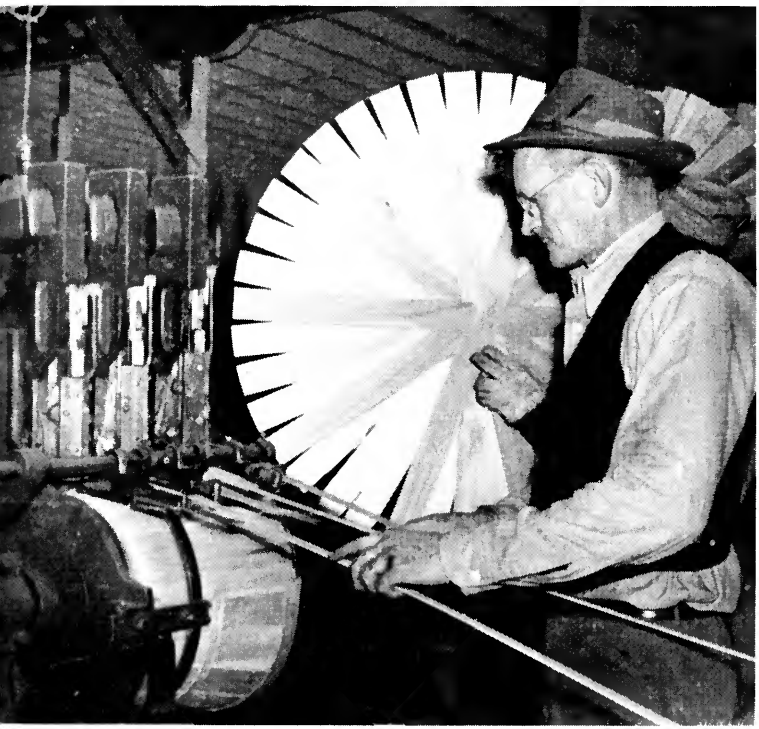


The Illinois Veneer Container Industry



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UNIVERSITY OF ILLINOIS
AGRICULTURAL EXPERIMENT STATION

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FOREWORD

It is probable that timber-growing in Illinois will increase. Recent studies indicate that the annual production of woodlands in the state can be doubled or trebled through good management. They indicate also that some 3 million acres not now wooded are best adapted to forest tree crops and should be reforested.

With this likelihood that a larger supply of wood will be available to the wood-using industries of the state, it is important that present requirements and prospective future needs of existing industries be known. Established industries should be assured of a sustained adequate supply of raw material before new industries come in to utilize the increase.

This bulletin represents one phase of a study on the uses made of the products of Illinois woodlands and forest plantations. The veneer container industry is important not only because it draws its raw material from local woodlands but also because there is a great local demand for its products.

J. Nelson Spaeth, Head
Department of Forestry

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Urbana, Illinois October, 1949

Publications in the Bulletin series report the results of investigations made or sponsored by the Experiment Station

THE ILLINOIS VENEER CONTAINER INDUSTRY

By C. S. Walters, Assistant Professor of Forest Utilization

THE VENEER[a] CONTAINER industry converts standing trees or parts of them into baskets, boxes, crates, and other similar products. This study of the industry includes only those companies converting Illinois stumpage[b] into usable products and employing Illinois residents in their plants. There are nine of these companies, all located in the southern third of Illinois (Fig. 1). Although other factories throughout the state manufacture veneer containers of many types, they use only custom-cut veneer produced from logs grown outside Illinois and so are not within the scope of this study. Also excluded from the study are companies manufacturing industrial crating, boxes, or other containers made from thin lumber or plywood.[a]

In addition to the nine Illinois companies included in this study, supplementary data were obtained from one company each in Iowa, Missouri, and Kentucky because they draw upon Illinois forests for a part of their raw materials and thus afford markets for Illinois stumpage or logs.

The finished products of the Illinois companies are made entirely or partially of rotary-cut veneer. Although this study was not limited to the manufacturers of food packages, an estimated 80 percent of the veneer cut by the industry is assembled into fruit and vegetable packages and meat and poultry boxes.

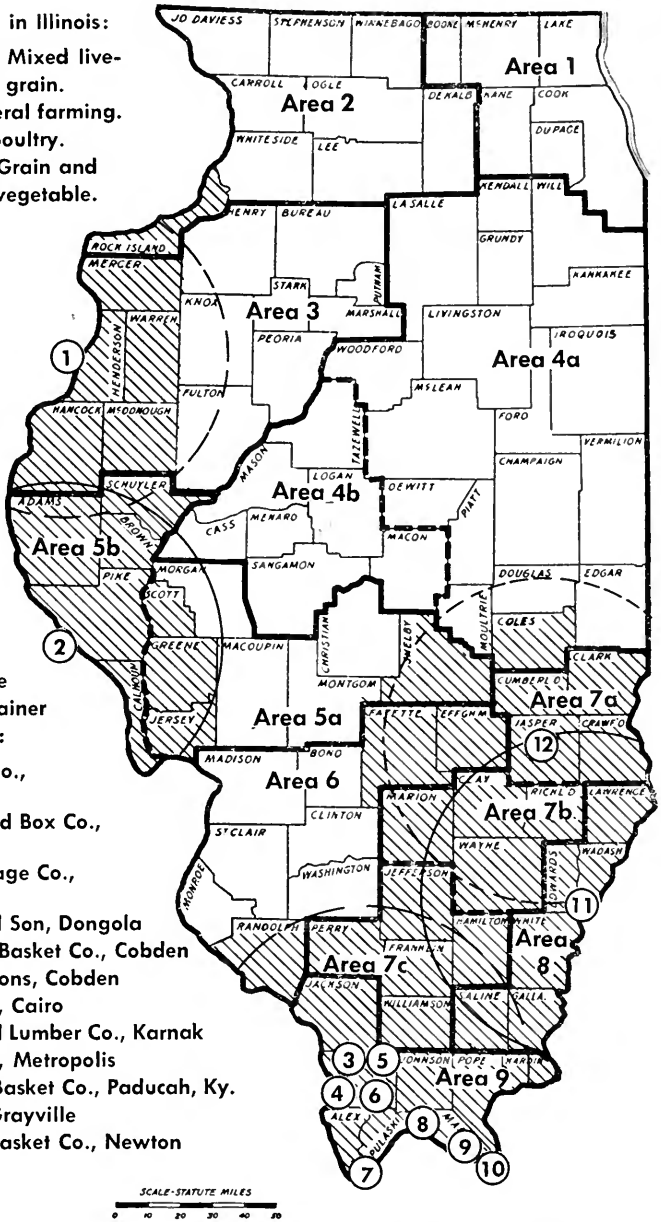
PURPOSE AND METHODS OF STUDY

This study was made in order to determine the present status of the industry, its methods of operation, and its future possibilities. The primary objects were to determine (1) present operations and efficiency[c] of the industry; (2) importance of the industry to the economy

[a] *Veneer* is a thin sheet of wood (usually ¼ inch or less in thickness) cut on a veneer machine. It may be sawed, sliced, half-round-cut, or rotary-cut. *Plywood* is made of three or more layers of veneer joined with glue and usually with the grain of adjoining plies laid at right angles.

[b] *Stumpage* is (a) standing trees or (b) the value of timber as it stands uncut in the woods.

[c] Efficiency studies are usually based on micromotion (stop-watch) technics. However, in this study no time data or formal analyses of methods were obtained.



Major type-of-farming areas in Illinois; location of veneer container companies included in this study; and areas supplying logs to these companies. Log-supply areas (circular) have a scaled radius of 50 miles. Counties producing most of the logs used by the industry are shaded. (Fig. 1)

and welfare of southern Illinois; (3) the relation of its annual requirements to the present and future timber supplies; and (4) the possibilities for its expansion when supplies of suitable raw materials, markets, and labor are considered.

Data for the study were obtained through correspondence and in personal interviews with representatives of the companies during the factory inspections. Figures obtained were for a "normal" year, usually 1947. Much of the screening of companies was accomplished by correspondence. Visits to factories and woodlands were generally made in company with the District Forester.

EARLY HISTORY AND DEVELOPMENT OF THE INDUSTRY

Until 1883 southern Illinois growers of fruits and vegetables generally used boxes and barrels of thin lumber for shipping fruits and vegetables. The containers were hand-made and laborers were paid 75 cents for assembling 1,000 boxes or 50 cents for one hundred 24-quart berry crates.

As early as 1867, however, M. L. Dunlap saw the possibilities for manufacturing veneer containers in southern Illinois.[a] By that time veneer containers were being manufactured in Michigan and some other states, but apparently lack of proper transportation made them generally unavailable to southern Illinois growers. At a meeting of the Illinois State Horticultural Society, he remarked: "You need not send to Michigan for baskets, although they are making excellent ones there. You have the timber and can make them as cheaply here."[5*]

The veneer container industry as it exists today in Illinois was probably started in 1883 by the Fruit Growers Package Company, Jonesboro. This company is still operating, using the same veneer lathe with which it started business. In 1890 H. A. DuBois built a plant at Cobden.[2*] His son and grandsons are still operating the plant.

The earliest known report on the industry was included in a survey of the state's secondary wood-using industries[b] in 1909.[9*] Sixteen companies, two of which are still operating under the same name, were

* All superior figures with asterisks refer to literature citations on page 429.

[a] The Illinois State Horticultural Transactions for 1866 contain a reference to the manufacture of Halleck boxes by Charles Colby of South Pass (now Cobden). However, nothing is known about the extent of his operations, and it may be assumed that the volume of his output was small.

[b] *Secondary wood-using industries* are those that, as a class, do not obtain their raw material directly from the forest.

then listed as manufacturers of baskets and fruit packages. Most of these items were made of veneer.

That year nearly 17 million board feet of timber were used. Of this amount 43 percent was red gum,[a] 14 percent tupelo, 10 percent yellow poplar,[b] and 10 percent cottonwood. White elm (which was used to a large extent for making basket rims and bands), sycamore, and soft maple followed in importance. While sugar maple and Norway pine did not make up a high percentage of the total amount of wood, they were reported to be the principal species used for split baskets.

Only one other industry (cooperage) reported as low an average cost for its "rough material." The low cost of the material used by the veneer container industry is explained in the report by "the fact that a large percentage is purchased in the form of logs from which veneer is cut, and the price is based upon the cost of logs." The average price per M B.M.[c] for the thirteen species listed was $14.06. The seven species used in largest amounts ranged in price from $9.90 per M B.M. for tupelo to $18.22 for yellow poplar.

The industry got about 35 percent of its raw material from Illinois — which was a higher percentage than for any other wood-using industry. The rest of the material came from Missouri, Kentucky, and Tennessee.

In addition to the sixteen companies making baskets and fruit packages, 175 were listed in 1909 as manufacturers of boxes and crates. These items were all grouped together in the survey, whether they were made of veneer, thin lumber, or plywood. Of the total volume of wood used by these companies, about 7½ million board feet (2 percent) came from Illinois woodlands. What percent of this material was used in the form of veneer is not known. Over half the wood was tupelo. Since tupelo containers impart no flavor to their contents, they were used to ship meat and other similar products.

In 1923 nine companies in southern Illinois were listed as members of the veneer industry.[8*] About 750,000 board feet of wood were used annually.

In 1940 Illinois companies manufacturing boxes, baskets, and crating used 85,695,000 board feet of native hardwood, according to an estimate of the U. S. Forest Service.[6*] Of this amount 70,290,000

[a] A list of common and scientific names for all trees mentioned in this study is given in the Appendix.

[b] *Yellow poplar* is the trade name for wood from the tuliptree or yellow poplar.

[c] M B.M. stands for thousand feet board measure.

board feet were used as lumber; 10,427,000 as veneer and plywood; and 4,978,000 as logs and bolts.[a] Neither the volume of wood manufactured into veneer containers of the type included in this study, nor the percentage which came from trees grown in Illinois is known.

PRESENT OPERATIONS

Nine Illinois companies are now making containers of veneer produced entirely or partially in Illinois or are cutting veneer for other companies to assemble. In addition, three veneer container industries outside the state (one each in Iowa, Kentucky, and Missouri) draw upon Illinois woodlands for part of their raw materials.

Most of the logs used by the Illinois industry are grown in the state; some are imported from other states but are cut into veneer in this state. One company imports some custom-cut veneer in addition to using locally produced material.

Seven of the nine Illinois companies have a complete operation, ranging from cutting the logs into bolts for veneering to assembling the veneer. One company just cuts veneer and sells it to other plants for assembly; and one buys all its raw materials in the form of custom-cut veneer.

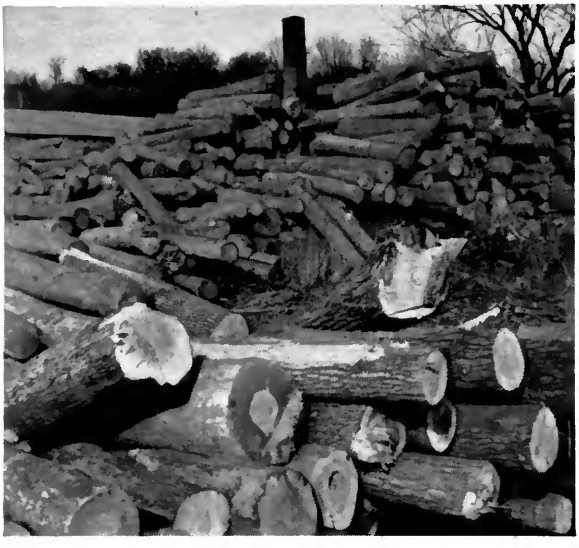
Securing Raw Materials

In a normal year the industry requires 15,228,000 board feet of raw materials, of which 13,908,000 are purchased in the form of logs (Fig. 2) and 1,320,000 as veneer. About one-third of the logs are sawn into thick or thin lumber by sawmills operated in conjunction with the veneer plants; and 9,184,000 board feet are cut into veneer (Table 1). Some of the lumber is sold locally and some is sold in carload lots, but much of it is used by the operators for box cleats, ends and centers of egg cases, and similar items. The volume of lumber salvaged from veneer cores (Fig. 11) is not known.

Supply areas

At present most logs are obtained less than 40 miles from the plant. The maximum hauling distance is about 60 miles. Since deliveries are seldom, if ever, straight-line hauls, the supply areas shown in Fig. 1 have a scaled radius of 50 miles. Less than 5 percent of the stumpage comes from the Shawnee National Forest, state forests, or other public lands. The farm woodlands as a source of supply are the lifeblood of the industry.

[a] A *bolt* is a section of a log still in the round and less than 8 feet long.



Several thousand board feet of quality soft-hardwood logs are decked ready for manufacture into fruit and vegetable packages. Most of these logs are cottonwood, sycamore, and elm. (Fig. 2)

Rafting of logs to Illinois mills has almost ceased, although before 1945 an estimated 25 percent of the logs came at least part of the way to the mills by water. In the early 1900's logs were brought from as far south as Alabama by floating them down the Tennessee and Ohio rivers to Mound City, where they were loaded on cars and shipped by rail to Cobden.[2*] Logs cut in Kentucky have been rafted down the Cumberland or Tennessee river to the Ohio river and then to Metropolis. Several thousand board feet of logs were delivered to a Burlington, Iowa, plant via the Mississippi river in 1946, and 50,000 board feet in 1947. Fifty to 100 M B.M. are in the average raft.

Specifications

Species. In Table 1 the total amount of wood cut into veneer by the industry in a normal year is broken down to show what percentage of the whole is made up of each species. The percentages, of course, vary for individual companies, but the relative importance of the different species is about the same for all companies.

The manufacturers prefer the soft hardwoods[a] for container veneer. Sweet gum is probably the favorite species, followed by yellow poplar. Both are highly desirable woods for container veneer. According

[a] Botanically, the *hardwood* trees are those having broad leaves, such as cottonwood, oak, hickory, ash, and willow. The *softwoods* refer to those trees with needle-like leaves — the "Christmas trees," such as pine, spruce, and fir.

Table 1. — Estimated Volumes of Different Species of Logs Cut Into Veneer by the Illinois Veneer Container Industry in a Normal Year

Species	Board feet	Percent of total requirement
Cottonwood	5 510 400	60
Sycamore	1 102 080	12
Sweet gum	918 400	10
Yellow poplar (tuliptree)	642 880	7
Elm (American and slippery)	551 040	6
Maple, silver (soft)	183 680	2
Miscellaneous species[a]	275 520	3
Total	9 184 000	100

[a] Black gum, hickory, birch, basswood, hackberry, boxelder, etc.

to E. T. Woodworth, Fruit Growers Package Company, Jonesboro, the company used yellow poplar exclusively during the first few years it operated. The sapwood was peeled from the bolts and either burned or discarded, and only the heartwood was used to make veneer for fruit and vegetable packages. At present the Illinois industry as a whole uses a larger volume of cottonwood and sycamore because these woods are more abundant than the sweet gum or yellow poplar.

Some of the veneer container manufacturers cut oak for use as bands on baskets and lids, although most of the oak and other species of hard hardwoods which grow to saw-log size in southern Illinois are cut into lumber. Other companies will not buy oak but will use pecan. All the manufacturers dislike beech, but some of them will accept a few logs of good quality.

Log rules used. The Doyle Rule is used for buying logs by all companies except one, which uses the Doyle-Scribner (Appendix, page 431). When standing timber is purchased from private owners on a log-scale basis, the Doyle Rule is used. Timber sales from national forests are made on the basis of the Scribner Decimal C Rule and from state forests on the Doyle Rule.

Log grades. Only one of the companies contacted had a written set of log grades defining the acceptable limits of each grade and the prices paid. These are the grades this company uses:

Commercial grade. — Sweet gum, poplar, and ....., all first-grade veneer logs 18 inches to 36 inches in diameter and 12 feet or more in length, cut from green sound straight grain timber free from shakes, rots, decay, butt spurs, bevels, splits, cracks, or flat sides, with not more than one standard defect per 12-foot log or two standard defects per 14-foot or longer log, that will cut 95 percent clear veneering.

First grade. — Sweet gum, poplar, elm, birch, hackberry, and ....., all first-grade veneer logs 16 inches to 36 inches in diameter and 12 feet or more in length, cut from fresh green sound straight grain timber free from shakes, rots, decay, butt spurs, bevels, splits, cracks, or flat sides, with not more than two standard knot defects per 12-foot log or three defects per 14-foot or longer log, that will cut 90 percent clear veneering.

Second grade. — Sweet gum, poplar, birch, hackberry, basswood, soft maple, black gum, sycamore, cottonwood, all 14 to 36 inches in diameter, and tupelo 13 to 36 inches in diameter, ash and beech 16 to 36 inches in diameter, all medium-grade veneer logs 10 feet or more in length: cut from fresh green sound timber free from shakes, rots, and decay, with not more than one standard knot defect per 3-foot length, that will cut 66⅔ percent clear veneering.

Third grade. — All the above kinds of timber listed under first and second grades; also cypress, pine, oak, 10 to 36 inches in diameter; and ash and beech 14 to 36 inches in diameter; all 10 feet or more in length, cut from sound merchantable timber free from rots and decay, with not more than one standard knot defect per 2-foot length.

Since the other companies do not have a written set of log rules, the buyers have to depend on their past experience and their knowledge of what, in general, is wanted. Log producers or logging crews also use their marketing experience as a guide in supplying the demands of the companies.

Veneer manufacturers want logs that are as free as possible from knots, shakes, rot, sweep, and other blemishes which may reduce the yield of clear, quality veneer. Buyers therefore follow rather closely the quality requirements for commercial-grade and first-grade logs in the written specifications given above. The buyers are more lenient as to species, however, often accepting those not listed in first-grade specifications. They will also accept a few logs shorter than 10 feet or smaller than 14 inches, d.i.b.,[a] at the small end (some companies will buy an occasional log as small as 12 inches d.i.b.).

Companies operating sawmills along with their veneer mills can use a woods-run[b] grade of logs. Generally the log producers sell their "number 1" logs to the veneer mills and the "number 2" logs to sawmills.

At present, however, there is no specific definition of what makes a "number 1" log acceptable or what makes a "number 2" undesirable. A simplified set of log grades would help both the industry buyers and the log producers. All companies are concerned with the problem

[a] D.i.b. stands for diameter inside bark. Veneer logs are scaled at the top end and the smallest diameter is often used.

[b] *Woods-run* grade consists of logs as produced from the forest. Cull or non-merchantable logs are removed, but no selection of high-quality or large logs is made.

The black gum veneer log on which the hat is resting is a Number 2 log, according to the grades proposed below. It is 17 inches d.i.b. and 12 feet long. Just behind it is a Number 1 log, 15 inches d.i.b. and 15 feet long. The diameter kept it from grading as a Prime B log. (Fig. 3)

of securing logs of suitable quality at a satisfactory price, and certainly the farmer or timber grower is interested in selling his logs at a satisfactory price. Within the range of the buyer's appraisal of a log's value and the seller's appraisal is a figure which will allow both parties to operate their businesses profitably. This price should be based upon log quality as expressed by a log grade.

Because a written set of log grades would be valuable for the veneer container industry, the following grades are proposed:[a]

Prime A. Practically all (90 percent) surface clear on three visible faces.[b] Must be 17 inches or larger d.i.b. Only sweet gum and yellow poplar acceptable.
— Price[c] ..... M B.M.

Prime B. Same as "A," except that elm, birch, hackberry, cottonwood, basswood, soft maple, black gum, sycamore, and tupelo are acceptable.
— Price ..... M B.M.

Number 1 Grade. At least three-fourths (75 percent) of length on three visible faces must be surface clear in one cutting.[d] Must be at least 15 inches d.i.b. Sweet gum, yellow poplar, elm, birch, hackberry, cottonwood, basswood, soft maple, black gum, sycamore, and tupelo acceptable.
— Price ..... M B.M.

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[a] These rules are slight revisions of those developed by Purdue University in cooperation with the U. S. Forest Service.

[b] A *face* is any one-quarter of the surface of the log.

[c] To be inserted by company.

[d] A *cutting* is the length between surface defects (bumps, splits, cracks, knots, branch stubs, etc.), whether sound or unsound.

Number 2 Grade. At least one-half (50 percent) of length on three visible faces must be surface clear in two cuttings, neither of which shall be less than 3 feet long. Must be at least 12 inches d.i.b. Sweet gum, yellow poplar, birch, hackberry, basswood, soft maple, black gum, sycamore, cottonwood, tupelo, ash, beech, elm, boxelder acceptable.

— Price ..... M B.M.

Number 3 Grade. Will not meet Number 2 specifications.

— Price ..... M B.M.

or

Not wanted .....

A survey of the veneer logs found on the yards of five companies was made to find out what grades were actually purchased. Ninety-eight logs, scaling 13,332 board feet Doyle Scale, were graded at random, using the proposed grade rules described above. Table 2 shows the results of this study. Although all companies want only "number 1" logs, over half (53.5 percent) of the volume was Number 2 Grade or poorer. The Prime Grade represented more than one-third (35.2 percent) of the total volume, a rather high percentage for logs of this quality, but the volume of Number 1 Grade logs was the lowest of all.

If the industry is interested only in the higher grades of logs, reasonable percentages for the various grades might be 35 for Prime, 45 for Number 1, 15 for Number 2, and 5 for Number 3. It is reasonable to expect that the industry will always be forced to buy some poorer-grade logs, but with written log grades these could be held to a minimum. If the grade rules are published by the industry, together with prices, the log seller will be able to find out if his logs are suitable for container veneer. Premium payments for the top grades will help to improve the quality of the industry's log purchases.

Table 2. — Grades of Veneer Logs Found in Yards of Five Veneer Container Industries, Southern Illinois[a]

Species	Number of logs graded	Board feet, Doyle scale	Percent of total volume	Percent of each species classed in each grade					Average d.i.b., inches	Average length, feet
				Prime A	Prime B	No. 1	No. 2	No. 3		
Cottonwood.....	25	4 016	30.1	....	42.3	8.6	18.7	30.4	17.8	12.6
Sycamore.....	31	3 653	27.4	....	22.3	13.1	52.8	11.8	16.6	11.5
Soft maple.....	16	2 232	16.7	....	43.1	9.7	41.7	5.5	17.7	11.2
Elm.....	8	1 065	8.0	....	38.9	....	31.8	29.3	17.9	10.2
Sweet gum.....	8	985	7.4	49.3	....	23.6	16.1	11.0	16.4	12.8
Yellow poplar.....	6	823	6.2	....	....	15.4	71.5	13.1	16.8	12.0
Black gum.....	4	558	4.2	....	57.0	20.2	22.8	0	17.0	13.2
Total or average..	98	13 332	100.0	3.6	31.6	11.3	36.2	17.3	17.2	11.8

[a] These data were collected early in 1949 as supplementary material to the main part of the study, which was concluded in 1948. Classifications were made according to proposed grades on pages 397 and 398.

Buying practices

Most of the companies usually buy logs that have been cut and delivered to the mill by log producers.[a] When farm work is slack, farmers often cut and deliver a few logs to the mill. The companies may also buy the stumpage, either operating their own logging crews or contracting for log producers to cut down and deliver logs or bolts on a piece-work contract. The stumpage bought by the industry is usually selectively cut for soft hardwoods that will produce logs at least 14 inches in diameter at the small end.

Payment to the woodland owner or log producer is made periodically (usually each week) on the basis of log scale. Sometimes the company finances the log producer.

Log producers generally buy on a lump-sum basis, offering a flat price for the timber standing on a certain area. When state or federal foresters help the woodland owner to cruise and mark his timber according to sound forest-management principles, sales are made on a marked-tree basis. Timber from the Shawnee National Forest is sold on a marked-tree basis to the highest bidder. Timber from the Union State Forest is usually cut by state employes and sold as logs to the highest bidder.

Value of timber purchased

The price paid for stumpage depends upon many factors, such as logging chance, efficiency of woods crew, type of logging equipment to be used, markets for logs other than those of veneer quality, and the desire of the owner to sell timber or to have it removed from his land. Prices currently range from $7.50 to $20 per M B.M., averaging about $15. Farmers and other land owners, therefore, receive about $228,000 each year for growing the industry's timber supply.

Prices for logs range from $15 to $65 per M B.M., f.o.b. mill, and average about $45. Often an extremely low price is paid for low-quality logs to discourage the delivery of such logs. Some mills pay one price for all logs and will accept only those logs which meet their specifications.

Logging practices and costs

Three companies operate their own logging crews from time to time, in addition to buying logs cut by log producers and farmers. When log supplies were reduced to a critical level during World

[a] *Log producers* are also referred to locally as jobbers, producers, contractors, or operators. They generally buy standing timber, cut it and sell the logs, mine props, piling, and other forest products on the open market.

War II, several other companies organized logging crews in order to maintain production. Logging crews are generally employed locally when they are needed, so employment may not be continuous for any single crew.

Power equipment is used in the production of most of the logs, starting with chain saws and ending with mechanical hoists of different types for loading the logs. Several of the log producers, however, use hand tools instead of the power chain saw for cutting and bucking the logs. Sometimes, too, horses are used for skidding the logs, although tractors are generally used. Some logs are loaded onto the trucks by hand-rolling them up skids, but this work is generally done with jammers or by crosshauling.

Logs are usually hauled in popular makes of 1½-ton, flat-bed trucks equipped with log bunks (back cover). A few surplus "6-by-6" army trucks are in service. With six wheels, all of which receive power, these models have many advantages over the more commonly used trucks, and are particularly useful for logging bottomland timber.

These operations are usually paid for on a piece-work basis. Average costs range from $5 to $7 per M B.M. for cutting and bucking logs; $5 to $10 for skidding; $2 to $3 for loading; and $7 to $10 for hauling the logs to the mill. On the basis of these figures the logs cost $19 to $30 a thousand board feet to produce and $34 to $45 f.o.b. mill if the average stumpage price is $15 per M B.M.

Cutting practices vary with the log producer or the company. Some producers clear-cut timber purchased on an area or lump-sum basis, marketing the small trees as mine props, feltwood,[a] or pulpwood, and the larger trees as logs or piling. Generally cutters supplying logs solely to the veneer container industry do not cut trees having stump diameters below 12 to 14 inches. One company cuts only trees having stump diameters at least 22 inches.

Imports and exports

The Illinois companies in this study import an estimated 873,000 board feet of logs from neighboring states. Indiana supplies the most (425 M B.M.), followed by Kentucky (400 M B.M.) and Missouri (48 M B.M.). An additional 1,320 M B.M. of cottonwood is imported in the form of veneer from Missouri, Tennessee, and Arkansas for assembly in Illinois plants.

It is estimated that 1,320 M B.M. of logs produced in Illinois are delivered to firms in Iowa, Missouri, and Kentucky (90 M B.M.,

[a] *Feltwood* is cordwood used in the manufacture of paper roofing-felt.

930 M B.M., and 300 M B.M., respectively) for manufacture into veneer containers. The volume of logs, bolts, and veneer cut by the industry for veneer container companies in other states has been very small.

Manufacturing Processes

Handling logs at mill

Raw material is usually delivered in log form at eight of the nine companies; a few bolts are also occasionally delivered. (One company buys its raw material in the form of veneer.) At one mill the logs are unloaded in a log pond, and at the other seven they are delivered to a log yard. One of these seven companies is so located that rafted logs can also be carted from the river directly to the bolting saw.

Logs are usually loaded by hand onto a four-wheeled cart or "dolly" and wheeled by hand to the bolting saw. One company has a power winch which skids logs to the bolting saw on a skidway formed by two steel rails. The company which unloads its logs in a log pond has a jack ladder[a] for hauling logs to the mill and a swinging stiffleg boom for handling yarded logs. The jack ladder hauls logs to a deck, from whence they can be rolled downward to the bolting saw or sawmill carriage.

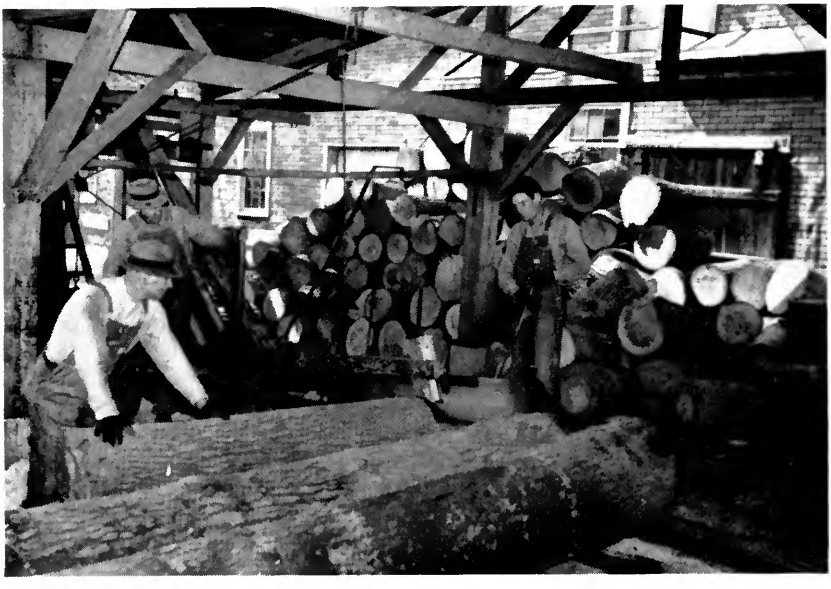
Bolting

With one exception, the companies cut their logs into bolts with a power dragsaw (Fig. 4). One company uses a chain saw powered with a gasoline engine (Fig. 5)[b] and is well pleased with its efficiency. One operator has tried circular and chain saws but has consistently depended upon the dragsaw. The other operators have used the dragsaw for several years; it has served them well, and they are reluctant to change to the expensive chain saw for which a specialized operating and maintenance crew must be trained.

Bolt lengths range from about 18 to 65 inches, depending upon what product is to be manufactured from the veneer. For example, bolts for quart-berry-box veneer may range from 43 to 46 inches, pint-box bolts from 34 to 38 inches, and bushel-basket bolts from 40 to 63 inches. Egg-case bolts are cut 30 inches long and are equalized or end-trimmed to 26 inches. A variety of lengths may be cut from the same log in order to utilize it efficiently and economically.

[a] A *jack ladder* is an inclined plane with a trough, up which logs are drawn into the mill by means of an endless chain or cable.

[b] Since the completion of this study in 1948, an electric model has been installed in place of the gasoline-powered saw.



These cottonwood logs are being cut into bolts by a dragsaw. Most of the veneer container manufacturers prefer this type of saw. (Fig. 4)

A power chain saw is being used to cut sycamore logs into bolts. Logs are small but of good quality. (Fig. 5)

These cottonwood and sycamore veneer bolts, which are to be made into fruit baskets, are ready for steaming. (Fig. 6)

Lengths may vary with the species, since one wood may be easily bent and, therefore, is more desirable for rim or band stock than for some other use.

Heating bolts

Some bolts are heated to soften the wood so that it may be debarked and cut easily. Bolts to be cut into thick veneer — stock for egg cases and some types of boxes — are not heated during the summer but are veneered while green. Some companies do not heat short bolts. Most companies do not heat such wood as gum and yellow poplar, which do not need softening.

Three companies heat their bolts in hot water, three heat them by steam, and two do not heat their bolts before veneering them. The bolts are rolled to the hot water vats or steam chests (Fig. 7) by hand. They are placed directly in the vats or chests without any other conditioning.

There appears to be no standard schedule among the operators for length of heating time or temperature of the water-bath for various species. The bolts are usually heated 12 to 24 hours. The heating vats do not have thermostatic controls. The water temperatures used vary

Left: A hackberry bolt is being hoisted from the hot water vat after soaking 24 hours. *Right:* A sycamore bolt is being removed from a steam chest. Hot water or steam heats the wood and softens it for cutting into veneer. (Fig. 7)

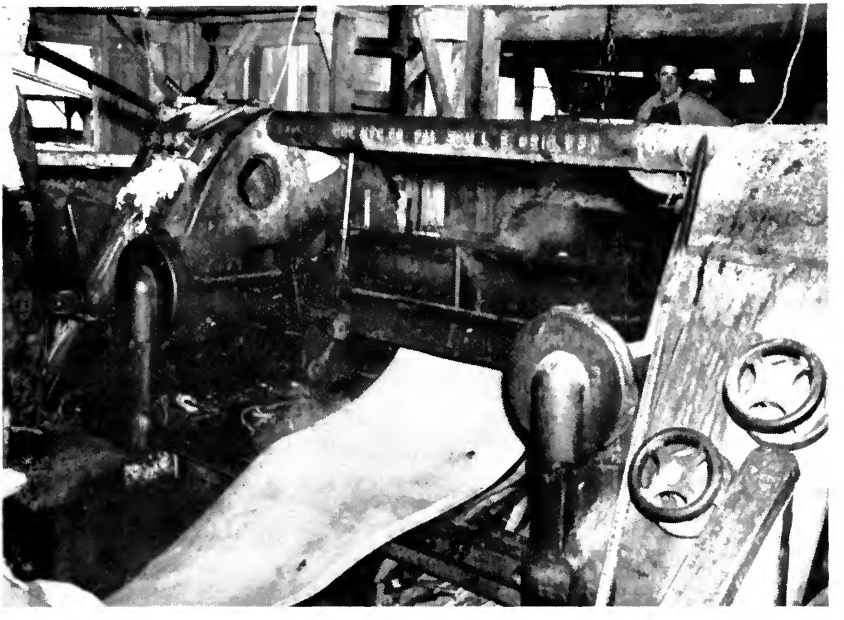
with the season and company but were approximately 160° F. when the plants were visited in early spring.

Debarking bolts

Bolts are taken out of the hot water vats by mechanical hoists and are debarked by hand. Both the head and blade of a poleax (single-bitted) are used to remove the bark from the bolt. The bark is often salvaged and burned for fuel. It is generally taken to the boiler or waste pile by hand methods, although two companies have mechanical conveyor systems for transporting the bark and other waste to the boilers.

Cutting bolts into veneer

One company uses a mechanical hoist to lift the debarked bolts to the lathes on the second floor, but the other companies roll the bolts to the lathes by hand. All veneer produced by the industry is rotary-cut. The bolts are lifted by a power hoist or block and tackle, centered in the lathe, and turned against a knife which peels a thin sheet of wood from the revolving bolt (Fig. 8). Lathe attachments also trim the edges of the veneer and sometimes score it for folding.



A sheet of veneer flows from the lathe toward the clipper, where it will be cut to size for poultry and meat boxes. (Fig. 8)

Veneer cores are stacked in the background. The marks on the ends are left by the veneer lathe. Bolts ready for veneering are piled in the left foreground. (Fig. 9)

The veneer lathes in Illinois plants will accommodate bolts up to 66 inches in length and 48 inches in diameter. When a bolt is cut down to a cylindrical core about 6 inches in diameter, it is removed from the lathe. The cores (Fig. 9) are either burned for fuel, sold for pulpwood, cut into dimensional stock for box cleats or for ends and centers of egg cases, or manufactured into novelties.

Cutting veneer to size

In most of the plants the long sheet of veneer is cut to size by a clipper. A few companies at times use a back roller attachment on the lathe which scores the bolt so that various container components are cut to size during the veneering operation (Fig. 10).

A back roller is attached to this veneer lathe, so that berry-box parts are cut from the bolt in a single operation. In the background a bolt is ready for hoisting into position on the lathe as soon as needed. (Fig. 10)

Grading container parts

The fruit- and vegetable-container parts are carried from the lathe or clipper to the grading tables by hand or on hand-operated carts. Women usually do the grading, since they have nimble fingers and the faculty for quickly sorting out and removing the defective pieces. Culled stock is generally hauled by hand methods to the boiler room, and usable stock is stacked in proper order for the machine operators. If the pieces have been previously scored, they are partially bent along the scored line before being sent to the stapling machines.

Above: Egg-case veneer is drying in outdoor racks before being assembled. (Fig. 11)

Right: Berry-box veneer is air-drying. Several pieces of veneer form a bundle. Air circulates through the spaces between bundles and dries the veneer. (Fig. 12)

Drying, assembly, and preparation for shipment

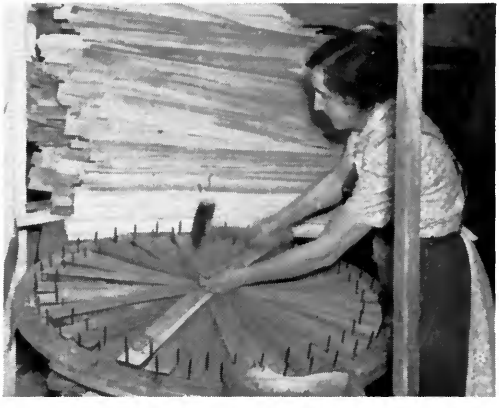
Thick veneer for egg cases and for wire-bound boxes is hauled from the graders to outdoor racks for air-drying (Fig. 11). Thin veneer is sometimes stacked for drying (Fig. 12) and sometimes dried in steam-heated mechanical dryers after being assembled.

Since the veneer is generally used soon after it has been cut or is air-dried, it is not treated to prevent the growth of molds or stain fungi. If, however, there is a delay of two or three days between the cutting and assembling operations, various molds and stain fungi do develop and grow luxuriantly on the moist wood. These harm only the appearance of the wood, and may be removed by brushing.

Preassembly operations are necessary for some types of containers. The components of some types of fruit packages are usually woven into webs or mats (Figs. 13, 14, and front cover) before they are formed and stapled by machine.

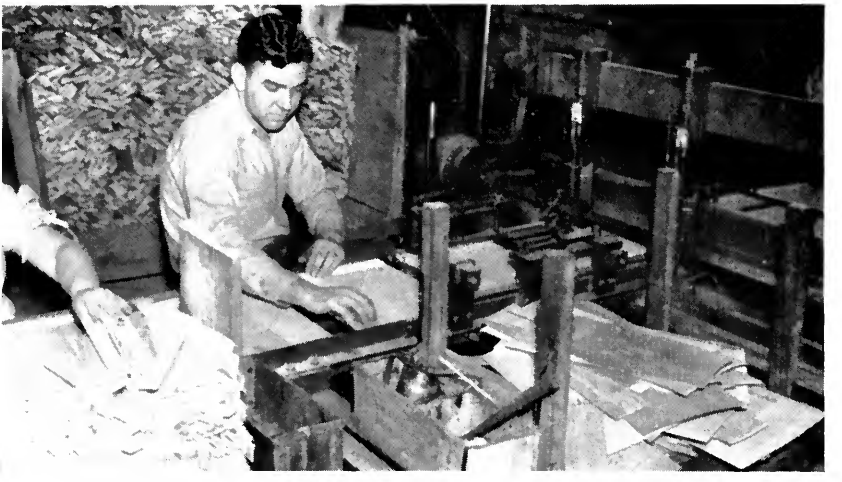
Various types of machines are used to assemble the veneer into containers. Nailing machines or those driving corrugated fasteners assemble the various parts of boxes, crates, or egg cases (Fig. 15). Box and basket machines mold the webs to form and attach the rims with wire staples (Fig. 14 and front cover). Handle machines attach the wire handles to bushel baskets, and the "down loopers" attach the wire clips which secure the lid after the basket has been filled. A special machine is needed for attaching the wire to veneer that will be used in the manufacture of wire-bound meat and poultry boxes (Fig. 16).

Some types of containers may be assembled before shipping,

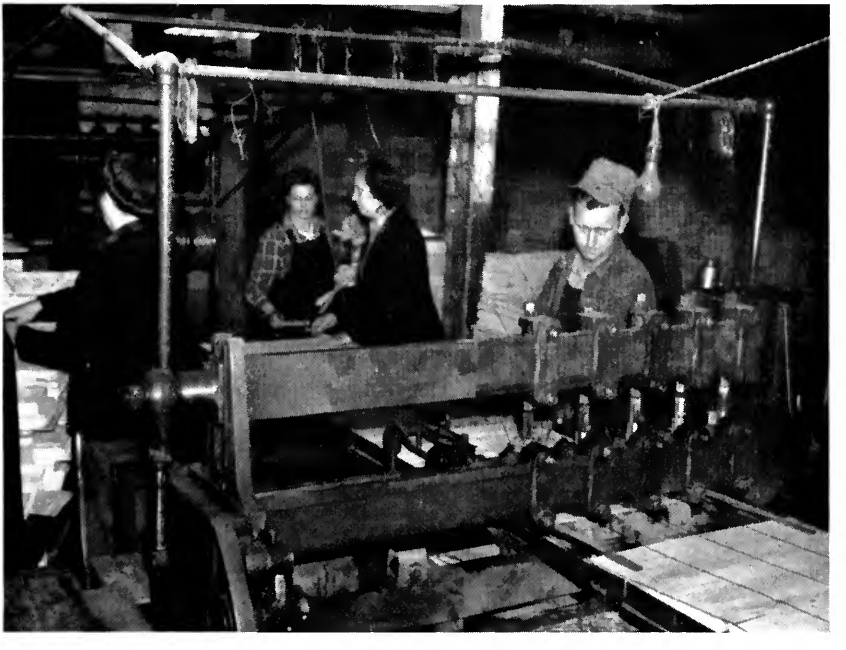


Above: **Strips of veneer are being woven into webs for bushel baskets. A single metal fastener at the center holds the strips together. (Fig. 13)**

Left: **A berry-box machine molds the veneer to shape and staples the rims. Preassembled veneer mats and rims are to the machine operator's left, and finished boxes ready for the driers to her right. (Fig. 14)**



Small cleats are stapled to the veneer by this machine. Parts are fed into the machine by the operators in the foreground. (Fig. 15)



This machine staples the wire to veneer for wire-bound meat or poultry boxes. Parts are assembled and fed into the machine at the left, and the half-finished box is taken from the machine at the right. (Fig. 16)

while others are shipped knocked-down. Berry boxes, for example, are shipped assembled — usually 500 in a fiberboard box; and bushel baskets are generally nested in one-dozen lots. Wire-bound meat and poultry boxes, on the other hand, are shipped knocked-down. Egg case ends and centers are baled in lots of 25, while the pieces of veneer for the sides and bottoms are baled in lots of 50. Crates of various types are often shipped knocked-down and are assembled by the customer.

PRODUCTS AND SALES

As has already been mentioned, about 80 percent of the veneer cut by the industry goes into fruit and vegetable packages and meat and poultry boxes. Of these, fruit and vegetable packages, including crates, account for the major share of the production. That Illinois fruit and vegetable growers have a definite interest in a sustained supply of quality wooden containers is shown by the state's average annual production of the more common fruits and vegetables (Table 3). If all products were included in the table, the total value would be about three times that of the products listed.

The different kinds of fruits and vegetables produced in Illinois require several types and sizes of containers for their transportation to market. The demand for each type of container is seasonal, depending on the harvesting times of the crops.

There is also a year-to-year variation in the demand for containers made by the Illinois industry. The yearly demand is determined by the size of the crops and the number and prices of

Table 3. — Average Annual Production and Value of Common Fruits and Vegetables in Illinois, 1934-1943[a]

Crop	Average annual production	Farm value
Apples	3 162 300 bushels	$3 499 500
Peaches	1 239 300 "	1 472 500
Strawberries	209 900 crates	577 700
Tomatoes	391 300 bushels	371 300
Sweet potatoes	358 500 "	363 100
Pears	516 900 "	305 100
Beans	215 300 "	266 600
Cucumbers	190 600 "	216 400
Total farm value		$7 671 700

[a] Source: Illinois agricultural statistics. Ill. Cooperative Crop Reporting Service, Ill. Dept. of Agr., cooperating with the U. S. Dept. of Agr. Cir. 444. 1945.

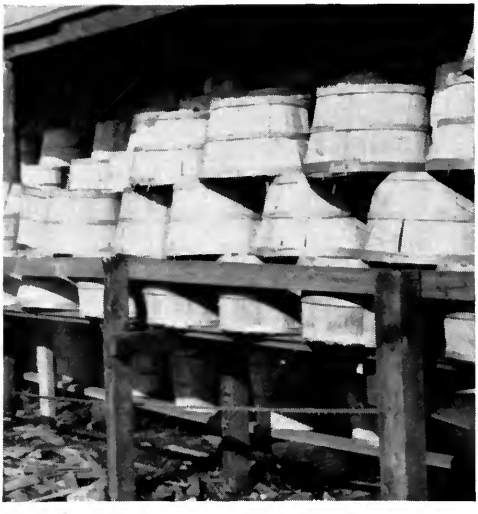
containers available from other sources. The manufacturers therefore cannot plan a rigid production schedule or count on manufacturing only specific items each year. A failure of the Illinois peach crop may leave the manufacturers with a large supply of peach baskets for which they have to seek other markets. A crop failure in another state often results in a surplus of baskets which may be shipped into Illinois and marketed in competition with local products. Lower wages in some areas make up for the costs of shipping manufactured products into Illinois.

Illinois fruit and vegetable growers import a large share of the baskets they use. Perhaps half of the 5 million baskets needed in a normal year to market the apple, pear, and peach crops are manufactured in Iowa, Missouri, Kentucky, Indiana, Tennessee, Arkansas, and Texas. A few baskets also come from New York, North Carolina, Alabama, and Ohio. Some baskets are also salvaged for re-use each year.

At least 12,000 strawberry and small-fruit crates are imported from Indiana, Missouri, Texas, and Arkansas. One organization reported also that an average of 6,000 fiber crates has been purchased annually during the past few years. In addition, Illinois growers buy several thousand salvaged crates each year from fruit and vegetable wholesalers who have imported strawberries early in the season from Tennessee and other southern states. The growers buy new boxes for

Table 4. — Estimated Annual Production of the Illinois Veneer Container Industry

Product	Number produced
Baskets	
Bushel (all types)	2 304 000
Other (market, Climax, etc.)	540 000
Boxes	
Berry—quarts	13 380 000
Berry—pints, ½ pints	1 600 000
Tills—1- to 4-quart capacity	3 000 000
Poultry, meat, cucumber and Leslie	1 685 000
Crates	
Berry and small-fruit	250 000
Other (James, cantaloupe, asparagus and industrial)	381 000
Egg cases (knocked-down or assembled)	362 000
Dirt bands	17 900 000
Tree wrappers and mats	106 000
Basket handles and shingle boards	4 500 000



These bushel baskets are stacked for drying. When dry, they will be nested in lots of one dozen for shipment to points throughout the Midwest. (Fig. 17)

Six- and eight-quart Climax baskets nested and tied in lots of 25 are stored ready for shipment. (Fig. 18)

the used crates. One company reported that, because of competition from salvaged crates, they had not manufactured small-fruit crates for two or three years.

Illinois meat and poultry packers buy veneer boxes from many sources. The percentage bought in the state is small. Most of the meat and poultry boxes made in Illinois are sold in other states.

Baskets

On the average, about 2.3 million (192,000 dozen) bushel baskets (Fig. 17 and Table 4) are made each year, about 90 percent of which are sold in the state. It is estimated that about 120,000 of these baskets

(5.2 percent) are shipped to Indiana; 65,000 (2.8 percent), to Missouri; and 11,000 (0.5 percent), to Wisconsin. A few baskets are exported to Kentucky, Michigan, and Iowa. Some of the baskets exported to neighboring states are again imported by Illinois growers.

About 540,000 (45,000 dozen) other baskets, such as market and Climax (Fig. 18) types, were reported. Climax baskets, which have a capacity of 4 to 12 quarts, are manufactured mainly for the grape growers in Hancock county.

Boxes

The industry reported a production of 13,380,000 strawberry quart boxes (Fig. 19). Although these may be used for cherries and other small fruits as well as strawberries, those sold in Illinois are used principally for strawberries.

About 4.4 million of the strawberry quart boxes made in Illinois are used to fill crates manufactured by the industry, and the others are shipped to growers for filling used crates or for local uncrated sales. Of these, about 4 million are sold in Illinois. About 1.5 million are shipped to Iowa, and similar numbers are sent to Michigan and to the Missouri-Arkansas area. Indiana receives approximately half a million. Smaller numbers are sent to Alabama, Virginia, Pennsylvania, Ohio, and other states as far west as Montana.

Slightly over one-half of the 1,600,000 pint and half-pint berry boxes produced are sold without crates. Almost all the boxes go to Illinois growers.

Quart boxes commonly used for strawberries are stacked for air-drying. Bushel-basket lids are drying in extreme right background. (Fig. 19)

Thousands of quart till baskets are stored ready for shipment. Baskets are nested and tied in lots of 50. (Fig. 20)

The industry reported a production of 3 million till boxes varying from 1- to 4-quart capacity. Whereas berry boxes are usually square in cross-section, tills are longer than they are wide (Fig. 20). They are most commonly used for artichokes, Brussels sprouts, and other small vegetables and fruits, although retail stores often sell apples, pears, plums, or pansies in them.

Poultry, meat, cucumber, and Leslie boxes are listed in the order of the number produced, totaling 1,685,000. The meat and poultry boxes are wire-bound. Most of them are shipped out of the state, the major volume going to Missouri, the Dakotas, Wisconsin, Michigan, western Minnesota, and Colorado. The poultry boxes go mostly to Missouri, Minnesota, and the Dakotas.

Cucumber boxes are of rather thick veneer and nailed construction. Often the grower's name or label is printed on the box at the plant before it is assembled. The Leslie box is small, has greater length than width, and has a "false" or raised bottom. The main feature of its design is that the veneer can be shipped flat and assembled with simple equipment. The corners are angled so that the bottom is held in place by projecting it through horizontal slits at the corners.

Crates

The average annual production of strawberry and small-fruit crates, complete with boxes, is reported as 250,000. (Most of these are for quart boxes.) Since James, cantaloupe, asparagus, and industrial crates (listed in order of number produced) are each produced by

just one company, the production of these items is shown in Table 4 as a group total of 381,000.

The manufacturer of the James crate said that it was developed for carrying fruit from the orchard to the packing shed. The sides of this crate taper toward the top, facilitating cubical stacking. The cleats bordering the top strengthen the crate, give it rigidity, and aid in handling and stacking, so that the fruit is protected during transportation to the packing sheds. Veneer framed with thin lumber and sawn cleats is manufactured into cantaloupe, asparagus, and industrial crates. The last type is used for the shipment of such items as refrigerators, stoves, and radios.

Other products

A total of 362,000 egg cases is produced, although only a few are assembled by the manufacturers. Most of the cases are sold directly to produce companies, which assemble them. Perhaps 20 percent of the cases go to companies manufacturing fiber fillers. Most of the egg

Each plant band in this greenhouse flat will be used to grow a plant large enough to transplant. Plants, with bands and soil, will then be lifted from the flat and put where they will mature. In foreground are folded bands. One opened and ready for use is on top of the flat. (Fig. 21)

Forest tree seedlings are packed in moist sphagnum moss before they are wrapped in a veneer tree mat. The entire bundle is secured with wire for shipment. (Fig. 22)

These bundles of veneer basket handles are ready for shipment. The handles are bent while they are wet and pliable and tied to keep them from straightening. (Fig. 23)

cases are shipped to Missouri, Minnesota, North and South Dakota, and Illinois points. A few are shipped to Iowa, Indiana, and other neighboring states.

Dirt bands are used in the growing of plants in greenhouse flats (Fig. 21). The industry makes 17,900,000 bands yearly and ships them to all parts of the United States. One company does nothing but assemble bands from veneer cut by other companies.

Tree wrappers are sheets of veneer used to protect the lower trunks of small fruit trees. Tree mats (Fig. 22) were developed by the Illinois State Division of Forestry as outside wrappers for shipping packages of forest-tree planting stock.[3*] About 7,000 board feet of logs are delivered to a veneer mill near the Union county nursery and cut into $\frac{1}{20}$-inch veneer clipped $2\frac{1}{2}$ inches wide. Nursery employes weave these strips into square or rectangular mats on a special loom during the winter months or other slack periods. The tree wrappers and mats are sold in Illinois.

About 4,500,000 veneer handles (Fig. 23) and shingle boards are manufactured, with handles representing the major part of the total. The handles are cut from gum and elm for use on both wooden and fiber market baskets. Over half the handles are sold in Illinois, with small quantities shipped to Missouri, Arkansas, Indiana, Ohio, and

Minnesota. The shingle boards are used on the tops and bottoms of packages of asphalt or composition shingles to protect them in transit or storage.

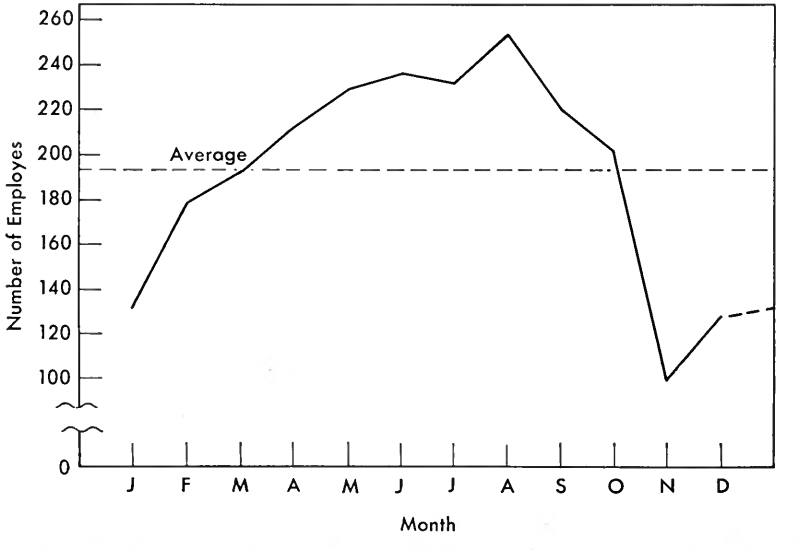
EMPLOYMENT AND WAGES

For Manufacturing the Containers

The nine Illinois companies employ in their mills an average of 550 persons, 200 of whom are women. No complete figures were secured on the number of persons employed during the various seasons of the year. In Fig. 24, however, which is based on reports made to the U. S. Bureau of Census in 1939 by five Illinois manufacturers of fruit and vegetable packages, seasonal fluctuations are indicated. Presumably the pattern of employment shown for 1939 still exists.

Most of the 200 women employed are in positions where nimble fingers or other dexterity is required. They generally do the sorting, grading, weaving, and assembling. Almost all the fruit and vegetable packages are assembled by women, particularly in plants where assembling is on a piece-work basis. Women also operate wire-bound-box machines, nailing machines, and other fabricating machinery.

The ages of employes range from 19 to nearly 70 years, with the



Number of employes receiving pay during normal payroll period ending nearest the fifteenth day of each month, as reported by five manufacturers of baskets for fruits and vegetables in 1939. (Fig. 24)

average age probably falling in the middle 40's. The average age for women is below that for men. There seem to be enough young people in training for the more skilled jobs, such as machine operators, or for replacement of supervisory personnel.

Average annual payroll for the industry totals $862,400. Supervisory personnel receive a weekly or monthly salary averaging about $50 a week. Machinists and other specialized maintenance employes, sawyers, and lathe operators receive from 90 cents to $1.50 an hour, perhaps averaging $1 an hour. Piece-work rates generally guarantee the workers at least 60 cents an hour. Workers employed in the log yards or on day work receive from 40 to 70 cents an hour. Two plants are operating under labor union contracts with a minimum wage scale of 70 cents an hour and an average of "about 80 cents."

As collective bargaining raises the minimum wage rate, it also raises the cost of the product, unless more goods are produced in a given period of time. Since the industry is now competing with nonresident firms paying lower wages, the Illinois companies may find it necessary to operate entirely on a piece-work basis.

Most plants work only 40 hours a week, but the largest factory works 47½ hours, which makes the weighted-average work week about 44 hours.

For Supplying Raw Materials

As has already been noted (page 399), three companies employ woods workers when they are needed. Usually these workers are employed locally near the logging operations. They are paid piece-work rates (see page 400).

In addition to the woods workers directly employed by the company, a number of log producers and farmers work varying lengths of time cutting and hauling logs for the industry. It is difficult if not impossible to collect accurate figures as to the total number of workers, including company-employed crews, log producers, and farmers, who are employed in supplying the industry with raw materials. However, a rough approximation may be made of the number of man-hours necessary to produce the industry's total requirements of wood. If 10 man-hours of labor are needed to produce and deliver 1,000 board feet of logs to the mill,[a] it will take 130,350 man-hours to produce the 13,035,000 board feet of logs cut and hauled to Illinois mills by Illinois workers. This is equivalent to the employment of 72 men for 225 eight-hour days each year.

[a] Cutting and bucking, 4.5 hours; skidding and yarding, 2.5 hours; loading and unloading, 1 hour; and hauling 2,000 board feet of logs 30 miles, 2 hours.

On the basis of average piece-work rates paid for cutting and hauling logs, the woods workers receive a gross income of about $325,000. Additional wages are expended by the Illinois industry for logs and veneer purchased from other states.

Seven men would probably have to work an entire year to produce the 1,320,000 board feet of logs cut in Illinois woodlands and sold to veneer container manufacturers in neighboring states. Wages paid for this work total about $33,000.

EFFICIENCY OF THE INDUSTRY

The manufacture of containers is a mass-production business. Methods of operation must be efficient if interest is to be returned on invested capital. Competition, both present and future, demands an efficient, economically operated business.

Although an analysis of methods should start in the woods, few of the Illinois companies operate their own woods crews; so the observations made in this study started in the log yard. No micromotion or time studies were made, but it is believed that the efficiency of the industry as a whole is lower than it should or could be. Efficiency varies widely from company to company.

Considerable discussion centers around the best type of bolting saw. Seven companies use the mechanical dragsaw and one uses the chain saw. (One of the nine companies does not cut its own veneer.) The chain saw, which has been developed more recently than the dragsaw, may be more economical and efficient, although there are no data to prove that either type of saw is the better. The operator that uses the chain saw is well pleased with it, but at least one other operator has tried the chain saw and has not been satisfied with the results. Woods experience has shown that it is necessary to thoroughly train the cutting crew in the proper methods of operating and maintaining the chain saw; untrained crews have not worked efficiently or economically.

More efficient use of floor space would considerably speed the flow of materials through a number of the plants. Some of the factories have grown from modest beginnings to their present size without any intervening reorganization or rearrangement of equipment. As a result, the machinery and other processing equipment is not efficiently arranged, and there is no straight-line flow of materials through the plant. This makes processing inefficient and time-consuming. Complete modernization would be extremely expensive and the investment probably could not be justified. However, much could be done at a

reasonable cost to speed the flow of materials through the plants. Because of the wide differences in factory arrangement and equipment, each plant would have a different reorganization problem.

Another factor which reduces economy and efficiency is the use of hand methods in some places where machinery could be effectively substituted. Debarking is done by hand, although it may be possible to add debarking devices to present veneer lathes. In a number of plants, box components are taken from one point to another by hand methods. Conveyors, wheeled trucks, or dollies could be used to good advantage. Perhaps more money is lost through inefficient handling of waste than in any other way. Waste materials are handled by hand methods in many of the plants, even though it would be practical and economical to make use of power conveyor systems.

Reduction of waste is important from the standpoint of conserving raw materials as well as for conserving labor. Waste starts in the woods when trees that cannot "pay their way" are cut. The value of the raw materials obtained from such trees is not equal to the cost of harvesting and hauling them. Many of the manufacturers have little control over the type of tree to be cut, since they buy logs from log producers or farmers, but the future existence of the industry depends to a large degree upon eliminating waste of all types.

IMPORTANCE OF THE INDUSTRY TO SOUTHERN ILLINOIS

Several small communities in southern Illinois[a] are supported partially or almost entirely by the veneer container industry. The industry not only affords woodland owners an opportunity to market their crop of veneer logs at better-than-average prices, but it also provides employment opportunities, capital and machinery for the production of goods, and a supply of quality containers for the local fruit and vegetable industry.

The industry's contribution to the economic welfare of the local communities and the state for a normal year is substantial. It pays an average of 550 people $862,000 in salaries and wages. In addition, about 70 woods workers receive a gross income of approximately $325,000 for logging and delivering the timber required by the factories. The woodland owners receive about $215,000 for growing the 14,355,000 board feet of Illinois stumpage which is cut for plants in Illinois

[a] Cairo, population 14,407; Cobden, 1,098; Dongola, 638; Grayville, 2,240; Jonesboro, 1,521; Karnak, 893; Metropolis, 6,287; Newton, 2,347. (1940 Census.)

or neighboring states. The industry collects nearly $2,000,000 annually for the products it sells, and most of this money is spent in southern Illinois. About $42,000 is paid to various city, county, state, and federal agencies in the form of employment, sales, and real estate taxes. Additional taxes are paid on income, which indirectly benefit southern Illinois. The depreciated, cash value of land, buildings, and machinery is about $650,000. (This current value may be somewhat inflated.)

FUTURE OF THE INDUSTRY

With Regard to Raw Materials

One of the major considerations in an analysis of the future possibilities of the industry is its supply of raw materials. To stay in business, each manufacturer must have a sustained flow of logs of the right quality and species from the woods to his plant. He must

Table 5. — Forest Area in Illinois Counties Supplying Logs to the Veneer Container Industry[a]

County	Farm woodland	Total forest area	County	Farm woodland	Total forest area
	acres	*acres*		*acres*	*acres*
Adams	69 919	74 584	Lawrence	26 359	27 114
Alexander	31 177	64 048	McDonough	24 369	24 906
Brown	33 088	33 588	Marion	59 510	59 510
Calhoun	57 636	59 994	Massac	31 650	36 390
Clark	48 490	48 490	Mercer	17 520	20 267
Clay	35 630	35 630	Perry	52 427	52 427
Coles	19 434	20 018	Pike	76 347	79 929
Crawford	30 563	30 563	Pope	20 188	89 140
Cumberland	22 921	22 921	Pulaski	26 568	27 699
Edwards	16 163	16 471	Randolph	81 292	81 780
Effingham	44 397	44 397	Richland	22 605	22 605
Fayette	80 904	80 904	Rock Island	20 078	24 547
Franklin	52 219	52 219	Saline	26 451	39 508
Gallatin	39 935	49 669	Schuyler	60 045	60 045
Greene	51 210	51 210	Scott	18 324	18 324
Hamilton	41 338	41 338	Shelby	35 660	35 660
Hancock	39 058	41 145	Union	57 287	94 645
Hardin	20 806	41 919	Wabash	10 124	10 316
Henderson	22 347	24 321	Warren	15 675	16 021
Jackson	83 395	114 391	Wayne	65 639	65 639
Jasper	32 892	32 892	White	28 079	28 612
Jefferson	59 878	59 878	Williamson	61 122	62 322
Jersey	55 240	60 640			
Johnson	54 142	63 489	Total	1 880 101	2 142 125

[a] Source: Forest resource appraisal, 1945. *Taken from* A plan for forestry in Illinois. Ill. Technical Forestry Association. 301½ E. Monroe St., Springfield. (Processed.) 1947.

Table 6. — Distribution of Upland and Bottomland Timber Types by Size Class and Crown Density in Four Type-of-Farming Areas in Southern Illinois[a]

Location	Stands of sawtimber by crown density classes[b]				Total sawtimber stands	Pole stands	Young growth (reproduction)	Total
	S-1	S-2	S-3	S-4				
Upland timber								
	acres	*acres*	*acres*	*acres*	*acres*	*acres*	*acres*	*acres*
Area 5b	5 414	20 701	113 357	95 052	234 524	22 786	17 312	274 622
Area 7	1 689	50 328	172 113	37 823	261 953	41 411	60 807	364 171
Area 8	6 396	19 823	29 545	18 416	74 180	7 215	4 677	86 072
Area 9	508	8 873	234 231	40 643	284 255	46 272	69 027	399 554
Total	14 007	99 725	549 246	191 934	854 912	117 684	151 823	1 124 419
Bottomland timber								
Area 5b	.....	16 958	4 332	.....	21 290	10 348	880	32 518
Area 7	29 458	87 029	26 045	5 906	148 438	59 794	5 699	213 931
Area 8	7 442	26 026	8 593	1 480	43 541	20 351	21 476	85 368
Area 9	7 959	2 697	31 468	22 200	64 324	34 748	32 155	131 227
Total	44 859	132 710	70 438	29 586	277 593	125 241	60 210	463 044
Upland and bottomland	58 866	232 435	619 684	221 520	1 132 505	242 925	212 033	1 587 463

[a] Source: Forest resource appraisal, 1945. *Taken from* A plan for forestry in Illinois. Ill. Technical Forestry Association. 301½ E. Monroe St., Springfield. (Processed.) 1947.

[b] Only stands containing more than 1,000 board feet per acre in logs 10 inches and larger d.i.b. were classed as sawtimber.

S-1: Sawtimber stands with 75 to 100 percent of ground shaded. (Dense stands.)
S-2: Sawtimber stands with 50 to 75 percent of ground shaded.
S-3: Sawtimber stands with 25 to 50 percent of ground shaded.
S-4: Sawtimber stands with 0 to 25 percent of ground shaded. (Open stands.)

obtain the logs at a cost which will allow him to sell his products at a profit in a competitive market.

Figure 1 shows those Illinois counties from which the industry obtains most of its logs. In Table 5 is shown the forest acreage of these counties. Of the 2,142,125 acres of woodland, about 88 percent (1,880,101 acres) is classified as farm woodland.

The type-of-farming areas shown in Fig. 1 are used quite generally by the Agricultural Experiment Station for summarizing data. They represent areas in which one or more dominant types of farming can be easily distinguished and within which natural agricultural resources and biological and economic conditions are highly uniform. To a large extent these natural resources and biological and economic conditions apply to the woodlands.

Table 6 shows the area distribution of upland and bottomland timber types by size class and crown density for four of the type-of-farming areas. Three of the areas (7, 8, and 9) include 1,280,323 acres from which the Illinois industry secures most of its logs.

Area 9, in addition to supplying Illinois plants, contributes a small volume of logs to a Kentucky plant. Area 5b does not supply logs to the Illinois industry but does supply one plant in Missouri almost entirely.

The industry is primarily interested in bottomland species. In Areas 7, 8, and 9 are 430,526 acres of bottomland timber on which must be grown most of the 15 million board feet used by the industry each year, as well as wood required for other uses.

Bottomland stands in southern Illinois have been reported to produce as much as 1,500 board feet an acre annually.[11*] A growth of 500 board feet an acre is a reasonable expectation if the timber is managed well. If each of the 64,324 acres of bottomland sawtimber in Area 9 alone were to produce only 400 board feet annually, a total of 25,729,600 board feet — about 70 percent more than the industry's present requirements — could be grown. The industry's present requirement of 15,228,000 board feet annually can be produced on 37,750 acres if an annual rate of 400 board feet an acre is maintained.

There is, then, no lack of potential raw material for the industry. The only prerequisite to a sustained flow of quality logs of the right species is good woodland management. In the past, however, many tree stands have not been managed as they should be. As a result, of the 430,526 acres of bottomland timber in Areas 7, 8, and 9, only 256,303 acres are classified as sawtimber[a] stands, and only 160,611 acres are of sufficient crown density (50 percent and over) to classify as reasonably well-stocked sawtimber. This means that the logs going to the industry are smaller and of poorer quality than they have been in the past. Unless some effort is made to improve management practices, future supplies of logs will be still smaller in size and lower in quality. With the type of machinery and methods now in use, the industry cannot process low-quality raw materials efficiently enough and economically enough to meet competition.

Managing tree stands is in many ways similar to managing other farm crops. Woodlands respond to protection from fire and grazing and to good cutting practices by producing a larger crop of high-quality timber.[b] The manager must cut no more than his woodland will grow each year, for overcutting and high-grading (taking only

[a] Only stands containing more than 1,000 board feet per acre in logs 10 inches and larger d.i.b. were classed as sawtimber.

[b] Members of the industry and woodland owners may secure assistance with management and reforestation problems by contacting the nearest District Forester; the State Division of Forestry, Department of Conservation, Springfield; or the Department of Forestry, University of Illinois, Urbana.

This butt log was cut from a 36-year-old cottonwood tree. The log is 10 feet long, is 25 inches d.i.b. at the top end, and contains 276 board feet, Doyle Scale. The stump was 32 inches in diameter. (Fig. 25)

the best trees) will eventually result in woodland deterioration and a reduced wood yield.

Good supplies of the species required by the industry depend on proper woodland management. It is possible that the various percentages shown in Table 2 may be adjusted slightly through management. For example, yellow poplar and sweet gum — both highly desirable veneer species — are recommended for reforesting certain lands[1*] and it may be possible to make available increased volumes of these species for future use. This, of course, will be a slow process. At present cottonwood is one of the most prominent bottomland woods and makes up about 60 percent of the logs purchased by the industry. Cottonwood can produce veneer logs in a relatively short time (Fig. 25), but special attention must be given the woodlands to encourage its reproduction.[10*]

Although many of our woodlands are at present depleted because of poor management in the past, efforts to conserve timber resources are probably as far advanced in Illinois as in other areas. There is some hope, therefore, that supplies of raw materials will gradually increase as more conservation measures are practiced.

With Regard to Labor Supplies

Laborers with specialized skills are needed to harvest and deliver veneer logs to the mills and to convert the logs into veneer containers. Producing the logs requires more skills than most of the jobs in the

plants. Even the highly specialized job of a veneer lathe operator can be filled with an employe who has had only one year of training, and most machine operators can be trained in less time. It takes considerably longer to acquire the skills necessary for a woods worker.

Woods workers must develop not only the skills required for their hazardous work but also the stamina for felling trees, cutting them into logs, and hauling them to market. They must also acquire at least a tolerance for an environment that is often uncomfortable.

That there is a potential labor supply in southern Illinois to meet the needs of the industry is indicated by several recent surveys. A study of a six-county[a] area[4*] containing four of the industry's plants showed that only 68.5 percent of the labor force was employed in 1940, whereas 85.5 percent was employed in the state and 85.6 percent in the whole United States. Eight percent of the total labor force in the six counties was seeking employment. The Illinois Department of Labor estimated in September, 1946, that 80 percent of the labor force in the six counties was employed. These data indicate a surplus of labor in the area.

Similar findings were reported in a study of the 16 southernmost counties of the state in 1940.[7*] Almost one-third of the labor force was unemployed, although the skill and the sex and age distribution of the labor force compared favorably with that for the entire state.

Although employment in southern Illinois has increased slightly since 1940, a surplus of labor still exists, according to reports from a number of sources. How long there will be a surplus of labor for the industry is problematical, but there is reason to believe that lack of labor is not likely to limit the future of the industry.

With Regard to Competition

Imported containers

The industry's competition from firms in areas paying lower wages has already been mentioned. These firms are located in Mexico as well as in other states. Robert W. Davis, Secretary-Manager of the American Veneer Package Association, in a letter dated March 19, 1948, writes that a large number of hand-woven baskets made with low-paid labor are being imported into this country from Mexico. In another letter (March 29, 1948) he says, "These baskets, I feel sure, are imported into Chicago in fair-size amounts, and we know that they have been used extensively . . . in the West in shipping produce into the large cities in Illinois."

[a] Perry, Franklin, Jackson, Williamson, Union, and Johnson counties.

Since the main costs of a product are labor and raw materials, it is reasonable to assume that the prices paid by the Illinois industry for logs or stumpage are reduced in order to meet the competition from firms paying lower wages. However, the container manufacturers are also in competition with the lumber industry so that the prices offered for logs must be high enough to secure the veneer-quality logs needed.

Used containers

Companies manufacturing fruit and vegetable containers have the problem of marketing their products in competition with second-hand or used containers. A well-made bushel basket, for example, may not be physically damaged after it has delivered one load of fruit to the consumer. As the cost of containers increases, the number re-used also increases. For a number of reasons, however, the use of second-hand containers is discouraged. Unsanitary containers obviously should not be used, and containers bearing the label of one packer or distributor cannot, according to law, be used by other dealers unless they destroy the label. There is also the possibility that second-hand containers will cause the product contained to lose its attractiveness or "consumer appeal."

Fiber packages

A report made nearly 40 years ago[9]* indicated that veneer boxes were then "making rapid progress in competition with the fiber package." More recently, however, the fiber package has been developed to the point where it competes with at least some types of veneer packages. It is less expensive, has an attractive appearance, and can be transported and stored knocked-down. Such containers can also be printed or decorated more easily than wooden containers.

New types of packages

Although the present veneer container is to its prototype what the modern automobile is to the gasoline buggy, new methods of packaging are creating competition. Many fruits, vegetables, and other foods are now frozen or dried near the area where they are grown and are shipped by air in other than wooden veneer containers. Packaging in various paper and plastic materials has often made the foods more attractive to the potential consumer.

Advantages of the veneer containers

Buyers have often complained that goods shipped in wood-substitutes have arrived at domestic and foreign destinations in unsatisfactory condition. Modern methods of transportation still require a

light, strong container that can stand punishment without deteriorating, and veneer containers satisfy these requirements. That they have withstood competition from other materials for many years is the result of long, satisfactory service. While modern methods of harvesting certain small grains tend to create a scarcity of straw for the strawboard manufacturers, wood crops can be grown continuously with a minimum of effort and expense. It is predicted that the demand for wooden veneer containers will continue into the future.

With Regard to Productive Capacity

The industry is not operating up to its potential capacity even with its present equipment. Though much of the machinery now in use was installed 40 to 60 years ago, these machines can be repaired cheaply and will produce the volume of goods currently needed to fill orders. New, more efficient equipment is expensive and not absolutely necessary to continue operations. So, even though modernization would increase the capacity tremendously, it is not likely that present equipment will be replaced in the near future.

Increased production is discouraged for several reasons. For one thing, the supply of high-quality logs is limited. Secondly, market conditions vary so much that forecasting future demands is risky. Finally, while cost of labor and materials has increased considerably since 1940-1945, wholesale prices on some containers have remained about the same. For example, one company indicated that now, when labor is paid 70 cents an hour, the price for berry crates is no more than when labor was paid only 46 cents an hour.

SUMMARY

Nine companies in southern Illinois manufacture veneer containers entirely or partially from Illinois-produced wood. Seven of these companies convert standing trees or parts of them into fruit and vegetable containers, meat and poultry boxes, industrial crates, egg cases, dirt bands, tree wrappers and mats, basket handles, shingle boards, and other similar items. One company produces veneer for other companies to assemble, and one buys custom-cut veneer for assembly.

The industry was started in 1883 by the Fruit Growers Package Company, Jonesboro, which is still in operation.

A total of 15,228,000 board feet of raw materials is normally required, 13,908,000 of which are purchased as logs, and 1,320,000 as veneer. About one-third of the logs are sawn into thick or thin lumber

by sawmills operated in connection with the veneer plants, and 9,184,000 board feet are cut into veneer.

Of the logs purchased, 13,035,000 board feet are grown in Illinois and most of this amount is produced in the farm woodlands. Farmers and other woodland owners receive about $228,000 for growing the logs used by the industry.

About 873,000 board feet of logs are imported from neighboring states, and 1,320,000 board feet of logs produced in Illinois are delivered to similar firms in neighboring states.

Sixty percent of the veneer logs used are cottonwood; 12 percent, sycamore; and 10 percent, sweet gum. Yellow poplar (tuliptree), elm, and soft maple total 15 percent of the volume. A very small amount of the hardwoods is cut for veneer.

The logs are cut by log producers or by company cutting crews. The work necessary to supply the yearly requirement of logs is equal to that of 70 people working full time through the year. The woods workers are paid piece-work rates, with gross income for a normal year totaling $325,000. In addition, the work of cutting logs from Illinois woodlands for out-of-state companies is enough to keep seven men busy full-time. In an average year wages for this work amount to $33,000.

The number of employes working in the factories averages about 550 for a year. Of these 200 are women. Employment is greatest during the summer (August) and lowest in the fall and winter (November). The annual payroll normally totals about $862,000.

The manufacture of veneer containers lends itself to the use of mass production methods. Many companies have not made efficient use of their floor space. Container components and, in particular, waste materials are often handled by inefficient, expensive hand methods.

The industry's sales total about $2,000,000 for a normal year. About $42,000 is paid to various county, state, and federal agencies for taxes. Additional taxes are paid on income. The depreciated, but perhaps currently inflated, cash value of the industry's land, building, and machinery is about $650,000.

Potential supplies of both raw material and labor are more than adequate for future continuance and expansion of the industry. There are 2,142,125 acres of woodland in the 46 counties which supply most of the logs for the industry. Eighty-eight percent of this acreage (1,880,101 acres) is in farm woodlands. There is enough acreage to supply much more timber than the industry currently requires. Over-

cutting, high-grading, fire, and grazing have, however, reduced the present yields of these woodlands and resulted in an annual crop of logs of lower quality than the industry desires.

At present there is a surplus of qualified labor in southern Illinois, and an adequate supply is anticipated for future requirements.

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APPENDIX

Trees Mentioned in This Study[a]

(All are hardwoods except the red or Norway pine.)

Common name	*Scientific name*
Basswood (*see* Linden, American)	
Beech, American	*Fagus grandifolia*
Birch, river	*Betula nigra*
Boxelder	*Acer negundo*
Cottonwood	
Eastern poplar	*Populus deltoides*
Swamp poplar	*Populus heterophylla*
Elm, American (*or* white)	*Ulmus americana*
Elm, slippery (*or* red)	*Ulmus fulva*
Gum, black (*see* Tupelo, black)	
Gum, red (*see* Sweetgum, American)	
Gum, sweet (*see* Sweetgum, American)	
Gum, water (*see* Tupelo, water)	
Hackberry, common	*Celtis occidentalis*
Hickory	*Carya spp.*
Hickory, pecan	*Carya illinoiensis*
Linden, American	*Tilia americana*
Maple, silver (*or* soft)	*Acer saccharinum*
Maple, sugar (*or* hard)	*Acer saccharum*
Oak	*Quercus spp.*
Pecan (*see* Hickory, pecan)	
Pine, red (*or* Norway)	*Pinus resinosa*
Poplar (*see* Tuliptree)	
Poplar, yellow (*see* Tuliptree)	
Sweetgum, American	*Liquidambar styraciflua*
Sycamore, American	*Platanus occidentalis*
Tuliptree	*Liriodendron tulipifera*
Tupelo, black	*Nyssa sylvatica*
Tupelo, water (*or* gum)	*Nyssa aquatica*

[a] Authority: Kelsey, H. P., and Dayton, W. A. Standardized plant names, second edition. J. Horace McFarland Company, Harrisburg, Pa. 1942.

Board Feet in Logs of Different Diameter and Length, According to Four Log Rules

Diameter in inches at small end, inside bark	DOYLE					SCRIBNER					DOYLE-SCRIBNER					INTERNATIONAL—¼ in. kerf				
	Length of log in feet																			
	8	10	12	14	16	8	10	12	14	16	8	10	12	14	16	8	10	12	14	16
	Board feet					*Board feet*					*Board feet*					*Board feet*				
10	18	23	27	32	36	25	32	40	45	50	18	23	27	32	36	30	35	45	55	65
11	24	31	37	43	49	32	40	50	55	65	24	31	37	43	49	35	45	55	70	80
12	32	40	48	56	64	40	49	59	69	79	32	40	48	56	64	45	55	70	85	95
13	40	50	61	71	81	48	61	73	85	97	40	50	61	71	81	55	70	85	100	115
14	50	62	75	88	100	57	71	86	100	114	50	62	75	88	100	65	80	100	115	135
15	60	75	91	106	121	71	89	107	125	142	60	75	91	106	121	75	95	115	135	160
16	72	90	108	126	144	79	99	119	139	159	72	90	108	126	144	85	110	130	155	180
17	84	106	127	148	169	92	116	139	162	185	84	106	127	148	169	95	125	150	180	205
18	98	122	147	171	196	106	138	160	187	213	98	122	147	171	196	110	140	170	200	230
19	112	141	169	197	225	120	150	180	210	240	112	141	169	197	225	125	155	190	225	260
20	128	160	192	224	256	140	175	210	245	280	128	160	192	224	256	135	175	210	250	290
21	144	181	217	253	289	152	190	228	266	304	144	181	217	253	289	155	195	235	280	320
22	162	202	243	283	324	167	209	251	292	334	162	202	243	283	324	170	215	260	305	355
23	180	226	271	313	359	188	235	283	330	377	180	226	271	313	359	185	235	285	335	390
24	200	250	300	350	400	202	252	303	353	404	200	250	300	350	400	205	255	310	370	425
25	220	276	331	386	441	229	286	344	401	459	220	276	331	386	441	220	280	340	400	460
26	242	302	363	423	484	250	312	375	439	500	242	302	363	423	484	240	305	370	435	500
27	264	330	397	463	530	274	342	411	479	548	264	330	397	463	530	260	330	400	470	540
28	288	360	432	504	576	291	364	436	509	582	288	360	432	504	576	280	355	430	510	585
29	312	391	469	547	625	304	380	457	539	609	304	380	457	539	609	305	385	465	545	630
30	338	422	507	591	676	328	410	493	575	657	328	410	493	575	657	325	410	495	585	675
31	364	456	547	638	729	355	444	532	622	710	355	444	532	622	710	350	440	530	625	720
32	392	490	588	686	784	368	460	552	644	736	368	460	552	644	736	375	470	570	670	770
33	420	526	631	673	841	392	490	588	686	784	392	490	588	686	784	400	500	605	715	820
34	450	562	675	787	900	400	500	600	700	800	400	500	600	700	800	425	535	645	760	876
35	480	601	721	841	961	438	547	657	766	876	438	547	657	766	876	450	565	686	805	925
36	512	640	768	896	1024	461	576	692	807	923	461	576	692	807	923	475	600	725	855	980
37	544	681	817	953	1089	514	643	772	901	1029	514	643	772	901	1029	505	635	770	905	1040
38	578	723	867	1011	1156	534	667	801	934	1068	534	667	801	934	1068	535	670	810	955	1095
39	612	765	918	1070	1225	560	700	840	980	1120	560	700	840	980	1120	565	710	855	1005	1155
40	648	810	972	1134	1296	601	752	903	1053	1204	601	752	903	1053	1204	595	750	900	1060	1220
41	684	856	1027	1198	1369	636	795	954	1113	1272	636	795	954	1113	1272	625	785	950	1115	1280
42	722	902	1083	1264	1444	671	839	1007	1175	1343	671	839	1007	1175	1343	655	825	995	1170	1345
43	761	951	1141	1331	1521	698	872	1046	1222	1396	698	872	1046	1222	1396	690	870	1045	1230	1410
44	800	1000	1200	1400	1600	740	925	1110	1295	1480	740	925	1110	1295	1480	725	910	1095	1290	1480

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With good care the woodlands of Illinois can continue to grow high-quality logs for the manufacture of veneer containers. Bushel fruit baskets are only one example of the type of container produced by this industry.